

REMARKS

Reconsideration of the above-identified application is requested in view of the remarks that follow.

In the June 30, 2006, Office Action in this application, the Examiner objected to claim 6 because it contained a typographical error.

As indicated above, claim 6 has been cancelled.

The Examiner rejected claim 4 under 35 USC §112, second paragraph, as being indefinite.

As indicated above, claim 4 has been cancelled.

The Examiner also cited the limitation “semiconductor material” in claims 5 and 6 as lacking antecedent basis.

As indicated above, claims 5 and 6 have been cancelled.

It is believed that newly-added claims 7-9 are in compliance with all requirements of 35 USC §112.

The Examiner has rejected claims 4-6 under 35 U.S.C. 103(a) as being unpatentable over the Bol et al. '775 patent in view of the Pfirsch '445 patent. As indicated above, claims 4-6 have been cancelled. New claims 7-9 have been added. For the reasons set forth below, Applicant traverses the foregoing rejection as applied to new claims 7-9.

As discussed in the application at page 2, lines 3-9, the present invention uses a single mask and a single dopant implant step to improve the voltage breakdown characteristics of a semiconductor junction. The claimed method utilizes the well known “volume effect” of small implant windows to grade the doping of a single implant; prior art techniques require multiple implant steps to provide a graded dopant profile. The “volume effect” occurs when an implant is made through a small mask opening and the subsequent diffusion step of the implanted dopant is sufficient to drive the dopant a distance that is greater than the size of the small opening. As discussed at page 3, lines 15-18, of the application, for this single implant technique to work, the minimum geometry of the small mask opening must be two time (2x) the lateral diffusion length of the primary junction of the associated primary dopant region. As further discussed therein, it

is well known that minimum geometry mask openings will restrict the amount of dopant that can be placed in the small mask opening regions of the substrate relative to the amount of dopant that is placed in a larger primary dopant region during the single implant step (i.e., the “small volume” effect discussed above).

Thus, the method of the present invention, as recited in new claims 7-9, implants dopant into a semiconductor substrate through mask openings of different size. The method diffuses the implants from the different size mask openings together into a single, merged dopant region. Furthermore, the merged dopant region is not uniformly doped. Rather, the single, merged region resulting from the diffusion step includes an interior portion that has a first dopant gradient with a first maximum dopant concentration and a perimeter portion that is contiguous with the interior portion but has a second dopant gradient with a second maximum dopant concentration that is less than the first maximum dopant concentration.

In contrast, the Bol et al. patent teaches the creation of a series of separate doped regions using several mask openings and a single implant; no specified width of mask opening is disclosed or suggested. The Bol et al. reference does not teach or suggest implanting through related mask openings of different sizes in a single masking step to achieve related dopant regions having different dopant concentrations and then implementing a diffusion step to cause the related dopant regions to merge to provide a single graded dopant region, as claimed by Applicant. Bol et al. teach formation of a single dopant region that is uniformly doped.

The Pfirsch reference teaches the creation of two separate doped regions, one with a high doping concentration and one with a low doping concentration, using various size mask openings and a single implant step. The Pfirsch reference does not teach or suggest using mask openings of different sizes in the formation of a single, merged dopant region that has a graded dopant profile.

The only similarity between the teachings of the Bol et al. reference and the Pfirsch reference is that each reference teaches the use of a single implant step to arrive at its dopant implant structure, a structure that is vastly different than the single, merged graded dopant region resulting from Applicant’s claimed method. Therefore, not only is the technical disclosure lacking to combine the two references to arrive at the invention as recited in new claims 7-9, but it is submitted that a person skilled in the art would not be motivated to combine the two references to arrive at the claimed invention, technical insufficiency notwithstanding.

In view of the above, Applicant submits neither the Bol et al. reference nor the Pfirsch reference, whether considered individually or in combination, either teaches or suggests the invention recited in Applicant's new claim 7-9. Thus, Applicant submits that all claims now present in this application are in compliance with the requirements of 35 USC §112 and patentably distinguish over the prior art. Therefore, it is requested that this application be passed to allowance.

Respectfully submitted,

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